

Claims

- [c1] 1. An extended Universal–Serial–Bus (USB) socket comprising:
- a socket pin substrate made of non–conducting material, the socket pin substrate having an upper socket–substrate portion and a lower socket–substrate portion forming a cavity between, the cavity being an opening sized to accept a pin substrate with metal contact pins of a standard USB connector plug;
 - a metal cover that partially surrounds the socket pin substrate, wherein an upper gap between the upper socket–substrate portion and an upper portion of the metal cover is sized to accept a metal cover of the standard USB connector plug, the metal cover having an opening to allow the pin substrate of the standard USB connector plug to fit through when being inserted into the cavity; and
 - standard metal contact pins, mounted on the upper socket–substrate portion, located to make physical and electrical contact with the metal contact pins of the standard USB connector plug when inserted;
 - extended metal contact pins, mounted on the socket pin substrate, located to avoid making physical and electrical

contact to the metal cover of the standard USB connector plug when inserted;

whereby extended metal contact pins do not make contact when the standard USB connector plug is inserted.

- [c2] 2.The extended USB socket of claim 1 wherein the extended metal contact pins comprise 8 pins;
wherein the standard metal contact pins comprise 4 pins.
- [c3] 3.The extended USB socket of claim 1 wherein the extended metal contact pins comprise a single row of pins or two rows of pins.
- [c4] 4.The extended USB socket of claim 1 wherein the standard metal contact pins carry standard USB signals during an initialization phase after insertion that includes a switch command sequence to switch to an extended mode;
wherein the extended metal contact pins carry extended-mode signals after the switch command sequence is sent over the standard metal contact pins.
- [c5] 5.The extended USB socket of claim 4 wherein the extended-mode signals comprise a transmit differential pair and a receive differential pair that each carry unidirectional signals, while the standard USB signals com-

prise a single differential pair that carried bi-directional data.

- [c6] 6.The extended USB socket of claim 5 wherein the extended-mode signals are PCI-Express signals, Serial-AT-Attachment signals, Serial Attached Small-Computer System Interface (SCSI), or IEEE 1394 signals.
- [c7] 7.An extended Universal-Serial-Bus (USB) connector plug for insertion into an extended USB socket or into a standard USB socket, the extended USB connector plug comprising:
an extended pin substrate that has an extended length that is longer than or equal to a standard length of the pin substrate of the standard USB connector plug;
plug standard metal contact pins on the pin substrate, wherein when the standard pin substrate of the extended USB connector plug is inserted into a cavity of the standard USB socket, the standard metal contact pins make physical and electrical contact with plug standard metal contact pins on a plug pin substrate;
plug extended metal contact pins on the extended pin substrate;
wherein when the extended pin substrate of the extended USB connector plug is inserted into a cavity of the extended USB socket, the plug extended metal contact pins on the extended pin substrate make physical and

electrical contact with socket extended metal contact pins on the extended USB socket;
whereby the plug extended metal contact pins make contact when the extended USB connector plug is inserted into the extended USB socket, but do not make contact when inserted into the standard USB socket.

[c8] 8.The extended USB plug of claim 7 wherein the plug extended metal contact pins are recessed into the extended pin substrate of the extended USB connector plug,
wherein the plug extended metal contact pins do not make contact to a standard metal cover when the extended USB connector plug is inserted into the standard USB socket with the standard metal cover,
whereby recessing the plug extended metal contact pins prevents shorting to the standard metal cover of the standard USB socket.

[c9] 9.The extended USB plug of claim 7 further comprising:
a set of ribs on the extended pin substrate, adjacent to the plug extended metal contact pins of the extended USB connector plug;
wherein set of ribs prevents the plug extended metal contact pins from making contact with a standard metal cover when the extended USB connector plug is inserted into the standard USB socket with the standard metal

cover,

whereby the set of ribs prevents shorting to the standard metal cover of the standard USB socket.

[c10] 10. The extended USB plug of claim 7 wherein the plug extended metal contact pins comprise 8 pins; wherein the plug standard metal contact pins comprise 4 pins.

[c11] 11. The extended USB plug of claim 7 wherein the plug extended metal contact pins comprise a single row of pins or two rows of pins.

[c12] 12. A multi-personality serial-bus interface comprising: dual-personality socket means for connecting to a standard-protocol plug and for connecting to an extended-protocol plug, the dual-personality socket means having a socket cavity, the socket cavity able to accept a standard-protocol plug, the socket cavity also able to accept an extended-protocol plug, the dual-personality socket means including standard metal contacts that make contact with the standard-protocol plug and extended metal contacts that make contact with the extended-protocol plug but do not make contact with the standard-protocol plug; standard-protocol processor means, coupled to the standard metal contacts, for generating and receiving

signals using a standard protocol for transmission through the dual-personality socket means;
extended-protocol processor means, coupled to the extended metal contacts, for generating and receiving signals using an extended protocol for transmission through the dual-personality socket means;
multi-personality bus switch means for connecting the extended metal contacts to the extended-protocol processor means when operating in a first extended mode, but for not connecting the extended metal contacts when operating in a standard mode; and
program means for executing an initialization program that initially sends and receives commands using the standard protocol through the standard-protocol processor means, but switches from the standard mode to the first extended mode to send and receive commands using the extended protocol through the extended-protocol processor means when the extended-protocol plug is detected,
whereby communication through the dual-personality socket means to the extended-protocol plug is initially using the standard metal contacts but switches to using the extended metal contacts.

[c13] 13.The multi-personality serial-bus interface of claim 12 wherein the standard protocol is Universal-Serial-Bus

(USB);

wherein the extended protocol is PCI-Express, serial ATA, Serial Attached Small-Computer System Interface (SCSI), or Firewire IEEE 1394.

[c14] 14.The multi-personality serial-bus interface of claim 12 further comprising:

second extended-protocol processor means, coupled to the extended metal contacts, for generating and receiving signals using a second extended protocol for transmission through the dual-personality socket means; wherein the multi-personality bus switch means is also for connecting the extended metal contacts to the second extended-protocol processor means when operating in a second extended mode, wherein the standard protocol, the extended protocol, and the second extended protocol are different protocols.

[c15] 15.The multi-personality serial-bus interface of claim 12 wherein the standard metal contacts of the dual-personality socket means comprise power and ground and a single pair of differential data lines that carry data in two directions; wherein the extended metal contacts of the dual-personality socket means comprise a second power and a second ground and a first pair of differential data lines

that carry data in an outgoing direction and a second pair of differential data lines that carry data in an incoming direction.

- [c16] 16. The multi-personality serial-bus interface of claim 12 wherein the dual-personality socket means comprises: socket substrate means for supporting the standard metal contacts; metal cover means for partially surrounding the socket substrate means and forming a cavity under a first portion of the socket substrate means, and forming a gap above the first portion; wherein the standard-protocol plug has a plug metal cover that slides in the gap and a plug substrate that fits in the cavity and plug metal contacts that make contact with the standard metal contacts when inserted; wherein the standard metal contacts are mounted on an underside of the first portion of the socket substrate means facing the cavity; and extended metal contacts mounted on a second portion of the socket substrate means, the extended metal contacts not contacting the plug metal cover of the standard-protocol plug when inserted, the extended metal contacts contacting plug extended metal contacts of the extended-protocol plug when inserted.

[c17] 17.The multi-personality serial-bus interface of claim 16 wherein the second portion of the socket substrate means is a lower portion below the first portion, wherein the cavity is between the first portion and the second portion of the socket substrate means;
wherein the extended metal contacts are mounted facing upward while the standard metal contacts are mounted facing downward;
wherein the extended metal contacts are mounted farther than the standard metal contacts are mounted from an open end of the dual-personality socket means that the standard-protocol plug is inserted into.

[c18] 18.The multi-personality serial-bus interface of claim 17 wherein the second portion of the socket substrate means further comprises:
a pivoting substrate that moves downwardly when the standard-protocol plug is inserted;
a mechanical switch on the pivoting substrate, the mechanical switch being pushed downwardly by the plug metal cover when the standard-protocol plug is inserted;
wherein the extended metal contacts are mounted on the pivoting substrate;
wherein the extended metal contacts are pivoted downwardly by the pivoting substrate when the mechanical switch is pushed downwardly by the plug metal cover

when the standard-protocol plug is inserted, whereby the extended metal contacts do not short to the plug metal cover because the extended metal contacts are pivoted downwardly by the pivoting substrate.

[c19] 19. The multi-personality serial-bus interface of claim 16 wherein the second portion of the socket substrate means is a lengthened portion next to the first portion, wherein the cavity is below the first portion and below the second portion of the socket substrate means; wherein the extended metal contacts are mounted facing downward and the standard metal contacts are mounted facing downward; wherein the extended metal contacts are mounted farther than the standard metal contacts are mounted from an open end of the dual-personality socket means that the standard-protocol plug is inserted into.

[c20] 20. The multi-personality serial-bus interface of claim 19 further comprising: two additional extended metal contacts mounted between outer pairs of the standard metal contacts, the two additional extended metal contacts for carrying extended-protocol signals or power or ground.

[c21] 21. The multi-personality serial-bus interface of claim 20 wherein the extended metal contacts comprise 6 metal

contacts in a back row;
wherein the standard metal contacts and the two additional extended metal contacts together comprise 6 metal contacts in a front row.

[c22] 22.The multi-personality serial-bus interface of claim 12 wherein the commands include a read-status command to read a status indicator that indicates when the dual-personality socket means is connected to the extended-protocol plug and when the dual-personality socket means is connected to the standard-protocol plug; the commands also including a switch command to switch operation to the first extended mode from the standard mode.

[c23] 23.A dual-personality connector plug comprising:
a housing for gripping by a user when inserting into a standard socket or into a dual-personality socket, the housing having wires passing there-through;
a pin substrate made from non-conducting material, extending outward from the housing along an insertion axis;
a metal cover, extending outward from the housing and wrapping around the pin substrate with sides parallel to the insertion axis and an opening perpendicular to the insertion axis at an end opposite the housing;
wherein the pin substrate has an insertable portion near

the opening that is thinner than a housing portion near the housing, wherein the insertable portion is for inserting into the standard socket or into the dual-personality socket;

plug standard metal contacts formed on a first surface of the insertable portion of the pin substrate, the plug standard metal contacts connected to the wires passing through the housing; and

plug extended metal contacts formed on the insertable portion of the pin substrate, the plug extended metal contacts connected to the wires passing through the housing.

[c24] 24.The dual-personality connector plug of claim 23 wherein the plug extended metal contacts do not electrically contact a metal cover or socket metal contacts of the standard socket when inserted, but the plug standard metal contacts make electrical contact with socket metal contacts of the standard socket when inserted; wherein the plug extended metal contacts electrically contact socket metal contacts of the dual-personality socket when inserted, and the plug standard metal contacts make electrical contact with socket metal contacts of the standard socket when inserted.

[c25] 25.The dual-personality connector plug of claim 23 wherein the plug extended metal contacts are formed on

a second surface opposite the first surface of the insertable portion of the pin substrate, the plug extended metal contacts being recessed into the second surface so that the plug extended metal contacts do not electrically contact the metal cover of the standard socket when inserted.

[c26] 26. The dual-personality connector plug of claim 23 wherein the plug extended metal contacts are formed on a second surface opposite the first surface of the insertable portion of the pin substrate; wherein the second surface is a moveable surface that retracts when the insertable portion is inserted into the standard socket.

[c27] 27. The dual-personality connector plug of claim 23 wherein the plug extended metal contacts are also formed on the first surface of the insertable portion of the pin substrate, the plug extended metal contacts being located farther from the opening than the plug standard metal contacts.

[c28] 28. The dual-personality connector plug of claim 23 wherein the standard socket is a Universal-Serial-Bus (USB) socket and wherein the plug extended metal contacts carry PCI-Express signals, serial ATA signals, Serial Attached Small-Computer System Interface (SCSI), or

Firewire IEEE 1394 signals.